

WHAT IS CLAIMED:

1. A redundant power supply device for an electrical system, comprising:

a first converting device configured to convert a first input voltage signal into a primary logic supply voltage signal;

5 a second converting device configured to convert a second input voltage signal into a backup logic supply voltage signal; and

first and second outputs configured to output the primary and backup logic supply voltage signals, respectively, to one or more components in the electrical system.

10 2. The redundant power supply device according to claim 1, wherein

the components of the electrical system include one or more circuit cards utilizing digital circuitry, and

15 each of the first and second converting devices is configured to convert a respective input voltage into a logic supply voltage signal that is compatible with logic levels associated with the digital circuitry of each circuit card.

3. The redundant power supply device according to claim 1, wherein the first and second converting devices are configured so that  
20 voltage levels of the primary and backup logic supply voltages are substantially equal to  $V_{cc} + V_{diode}$ , wherein

$V_{cc}$  is a voltage level associated with a HIGH logic level for digital circuitry in each circuit card, and

$V_{diode}$  is a voltage drop across an ORing diode in each circuit card.

25 4. The redundant power supply device according to claim 1, wherein each of the first and second converting devices include

a signal conditioner configured to receive an input voltage signal and output a conditioned DC voltage signal; and

a DC-DC converter operably connected to the signal conditioner to convert the voltage level of the conditioned DC voltage signal, thereby generating a logic supply voltage signal.

5        5.        The redundant power supply device according to claim 4, wherein the first and second converting devices are configured so that a voltage level of the primary logic supply voltage signal is higher than a voltage level of the backup logic supply voltage signal.

10        6.        The redundant power supply device according to claim 5, wherein the first input voltage signal is an AC voltage signal and the second input voltage signal is a DC voltage signal, and the signal conditioner of the first converting device includes an auto-ranging rectifier and filter.

15        7.        The redundant power supply device according to claim 1, further comprising: a monitoring device configured to output a signal indicating a status of each of the first and second input voltage signals.

20        8.        The redundant power supply device according to claim 1, wherein the second converting device is configured to convert one or more input voltage signals, which are received in addition to the second input voltage signals, into backup logic supply voltage signals that are distributed to the components of the electrical system.

25        9.        A dual-redundant power supply interface for a circuit card, comprising: a first input node configured to receive a first voltage signal supplied to the circuit card; a second input node configured to receive a second voltage signal supplied to the circuit card; and

a fault-tolerance module operably connected to the first and second input nodes, the fault-tolerance device being configured to allocate one of the first and second voltage signals as a logic supply voltage of the circuit card, while the other of the first and second voltage signals remains idle.

5           10.   The dual-redundant power supply interface according to claim 9, wherein

            the first voltage signal has a higher voltage level than the second voltage signal, and

            the fault-tolerance module is configured to allocate the first voltage  
10   signal as the logic supply voltage, while the second voltage signal remains idle.

            11.   The dual-redundant power supply interface according to claim 10, wherein

            the fault-tolerance module is configured to allocate the second  
15   voltage signal as the logic supply voltage when the first voltage signal becomes disabled.

            12.   The dual-redundant power supply interface according to claim 10, wherein the fault-tolerance module includes two diodes connected in a logical OR configuration.

20           13.   The dual-redundant power supply interface according to claim 12, wherein the fault-tolerance module has a configuration including,

            a first ORing diode whose anode receives the first voltage supply signal,

25           a second ORing diode whose anode receives the second voltage signal,

            an output node at which the cathodes of the first and second ORing diodes are commonly connected, the output node outputting the logic supply voltage to one or more components of the circuit card.

14. The dual-redundant power supply interface according to claim 13, further comprising:

a fuse connected in series with at least one of the first and second ORing diodes.

5           15. The dual-redundant power supply interface according to claim 13, wherein the first and second ORing diodes are Schotky diodes.

16. The dual-redundant power supply interface according to claim 15, wherein at least one of the components of the circuit card is a digital logic device.

10           17. The dual-redundant power supply interface according to claim 9, wherein

the circuit card includes digital circuitry, each of the first and second voltage signals being a DC signal whose voltage level is compatible with logic levels associated with the digital circuitry, and

15           the dual-redundant power supply interface further comprises:

one or more converters operably connected to the fault-tolerance module to receive the logic supply voltage, each converter being configured to convert the logic supply voltage and deliver the converted logic supply voltage to an operably connected component of the circuit card.

20           18. The dual-redundant power supply interface according to claim 17, wherein each converter is configured to electrically isolate the operably connected component from the components operably connected to the other converters.

25           19. The dual-redundant power supply interface according to claim 18, wherein at least one of the converters is a 1-Watt, 5-15V DC-DC converter configured to deliver the converted logic supply to a solid-state power controller (SSPC).

20. An electrical power distribution system comprising:  
a power supply device for generating redundant DC supply voltages  
from a plurality of power sources;

5 redundant power distribution buses operably connected to the  
power supply device to distribute the redundant DC supply voltages; and  
one or more circuit cards, each including,

a digital logic device; and

an interface operably connected to the redundant power  
distribution buses to receive the redundant DC supply voltages, wherein  
10 the interface is configured to allocate one of the redundant DC supply  
voltages as a logic supply voltage for the digital logic device.

21. The system according to claim 20, wherein the power supply  
device includes,

15 a first converting device configured to condition and convert a first  
input voltage signal into a primary logic supply voltage;

a second converting device configured to condition and convert a  
second input voltage signal into a backup logic supply voltage,

wherein the primary and backup logic supply voltages have voltage  
levels compatible with the logic levels associated with the digital logic  
20 device, the voltage level of the primary logic supply voltage being higher  
than the voltage level of the backup logic supply voltage.

22. The system according to claim 21, wherein the first and  
second converting devices each include a DC-DC converter.

23. The system according to claim 22, wherein  
25 the first input voltage signal is an AC signal and the second input  
voltage signal is a DC signal, and

the first converting device includes an auto-ranging rectifier and  
filter operably connected to the DC-DC converter.

24. The system according to claim 20, wherein  
the redundant DC supply voltages include a first and second DC  
supply voltage, the first DC supply voltage having a higher voltage level  
than the second DC supply voltage, and

5 the interface includes a fault-tolerance module operably connected  
to receive the first and second DC supply voltages from the power  
distribution buses, the fault-tolerance device being configured to allocate  
the first DC supply voltage as the logic supply voltage, while allowing the  
second DC supply voltage to remain idle.

10 25. The system according to claim 24, wherein the fault  
tolerance module includes two diodes connected in a logical OR  
configuration.

26. The system according to claim 25, wherein the interface  
further comprises:

15 a fail-safe mechanism operable to protect the first and second DC  
supply voltages when a short circuit occurs in the diodes of the logical OR  
configuration, the fail-safe mechanism including a fuse connected in series  
with each of the diodes, respectively.

20 27. The system according to claim 25, wherein the diodes are  
Schotky ORing diodes.

28. The system according to claim 24, wherein the fault-  
tolerance module is further configured to allocate the second DC supply  
voltage as the logic supply voltage when the first DC supply voltage  
becomes disabled.

25 29. The system according to claim 24, wherein each circuit card  
includes one or more solid-state power controllers (SSPCs), wherein the  
interface includes,

one or more DC-DC converters operably connected to the fault tolerance module to receive the allocated logic supply voltage, each DC-DC converter being configured to deliver a converted DC power source voltage to a corresponding one of the SSPCs.

- 5           30.   The system according to claim 20, including a status monitoring module configured to output a signal indicating a status of each of the plurality of power sources.